N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN
Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Causality

A → B
Pressure → Ulcer

Multicausality

Years smoking → Heart disease
High fat diet → Heart disease
Limited exercise → Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

• Controlling measurement

- Reliability
- Validity
- Number of measurement methods
- Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

No

Is the primary purpose examination of relationships?

No

Descriptive Design

Will the sample be studied as a single group?

No

Correlational Design

Yes

Quasi-Experimental Study

Is the treatment tightly controlled by the researcher?

No

Yes

Will a randomly assigned control group be used?

No

Is the original sample randomly selected?

No

Experimental Study

Yes
Selecting a Descriptive Design

- **Examining sequences across time?**
  - No
  - One Group?
    - No
      - Cross-sectional design
    - Yes
      - Data collected across time
        - No
          - Trend Analysis
        - Yes
          - Repeated measures of each subject
            - Yes
              - Longitudinal study with treatment partitioning
            - No
              - Cross-sectional design with treatment partitioning
A Typical Descriptive Design

Clariﬁcation ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

Variable 1

Variable 2

Variable 3

Variable 4

Description of Variable 1

Description of Variable 2

Description of Variable 3

Description of Variable 4

Interpretation of Meaning

Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

→ Describe

Comparison of Groups on Selected Variables

→ Interpretation of Meaning

Development of Hypotheses

Group II
{variables measured}

→ Describe
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Description of variable

Research Variable 2
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- **Control Group?**
  - No
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Comparison with population values?
          - No
            - Repeated Measures?
              - No
                - Strategy for Comparison
                  - No
                    - Suggest Reevaluating design
                      - Yes
                        - Compare treatment & control conditions?
                          - Yes
                            - Repeated Measures?
                              - No
                                - Strategy for Comparison
                                  - Yes
                                    - One group pretest/post-test design
Selecting The Type of Experimental Design

- **Pretest**
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
          - Yes
            - Blocking?
              - No
                - Comparison of multiple levels of treatment
              - Yes
                - Randomized Block Design
      - Yes
        - Repeated measures design

- Examination of complex relationships among variables in relation to treatment
  - Nested Designs
Pretest-Post Test, Control Group Designs

| Treatment: | Under control of researcher |
| Findings: | Comparison of pretest and post-test scores |
| | Comparison of experimental and control groups |
| | Comparison of pretest-post-test differences between samples |

| Randomly selected experimental group | PRETEST | TREATMENT | POST-TEST |
| Randomly selected control group | PRETEST |          | POST-TEST |

| Measurement of dependent variables | Manipulation of independent variables | Measurement of dependent variables |

Threats to validity:
- Uncontrolled: Testing, Mortality
- Instrumentation: Restricted generalizability as control increases
## Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Measurement of independent variables</th>
<th>Randomly selected control group</th>
<th>Treatment:</th>
<th>Under control of researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST-TEST</td>
<td>Measurement of dependent variables</td>
<td>POST-TEST</td>
<td>Findings:</td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Uncontrolled threats to validity:</td>
<td>Instrumentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mortality</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Limited generalizability as control increases</td>
</tr>
</tbody>
</table>
# Nested Design

## Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit C</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

## Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
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</table>
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design